

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 8J14PC	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00790	International filing date (<i>day/month/year</i>) 24/09/1999	Priority date (<i>day/month/year</i>) 25/09/1998
International Patent Classification (IPC) or national classification and IPC H04M7/00		
Applicant TELEFONAKTIEBOLAGET LM ERICSSON (publ) et al.		

1.	This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2.	This REPORT consists of a total of 8 sheets, including this cover sheet. <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of sheets.
3.	This report contains indications relating to the following items: <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input checked="" type="checkbox"/> Certain observations on the international application

Date of submission of the demand 13/04/2000	Date of completion of this report 09.01.2001
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer Teiwes, J Telephone No. +49 89 2399 7504



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00790

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-12 as published

Claims, No.:

1-26 as published

Drawings, sheets:

1/5-5/5 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

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☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	7-13, 16-26
	No:	Claims	1-6, 14, 15
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-26
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

Reference is made to the following document:

D1: EP 0853411 A2 (LUCENT TECHNOLOGIES INC.) 15. JULY 1998 (1998-07-15)

D2: WO 9742774 (TELEFONAKTIEBOLAGET LM ERICSSON) 13. November 1997 (1997-11-13)

Document D1 was not cited in the international search report. Hence, a copy of the document is appended hereto.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

- 1 The present application does not meet the requirements of Articles 33(1) and (2) PCT, because the subject-matter of claim 1 is not novel.
- 1.1 The present broad formulation of independent method claim 1 is such that its subject matter can be read onto prior art document D1, which relates to a method of transmitting signalling information between signalling points of a telecommunications system (see column 2, lines 34-49; fig.1).

In particular, document D1 discloses a method comprising transmitting signalling information between said signalling points via Internet Protocol based network (see column 2, lines 34-49; column 5, lines 14-19; fig.1).

Consequently, the features of independent claim 1 are already known from D1.

- 1.2 It should be noted that even if the Applicant were to interpret claim 1 in such a manner as to enable him to allege that its subject matter were novel, based on minor differences between the features of this claim and those disclosed in D1, the subject matter could still not involve an inventive step (Articles 33(1) and (3))

PCT) because D1 discloses the same object and the same type of solution with respect to the disclosure of claim 1.

- 1.3 The present broad formulation of independent method claim 1 is such that its subject matter can additionally be read onto prior art document D2, which relates to an *telecommunications management network connected to a common channel signalling network* (see page 4, lines 11-22; fig.3).
- 1.4 The additional features of dependent claims 2-13 are either disclosed by D1 (claim 2-6 see fig.1, obj.101,113,119,120) or seem to be implementation measures not involving any special technical effect or are well known in the art of telecommunications systems. Hence, the additional features of said claims do either not add anything novel or inventive to claim 1.
- 2 The structural features of independent apparatus claim 14 correspond to the already discussed method steps of independent method claim 1. Claim 14 is, therefore, not novel.
- 2.1 The structural features of dependent claims 15; 16; 25 correspond to the already discussed method steps of claims 3 and 5; 11; 7 respectively. Hence, these claims do either not add anything novel or inventive to claim 14.
- 2.2 The additional features of dependent claims 17-24 seem to be implementation measures not involving any special technical effect. Hence, the additional features of claims 17-24 do not add anything novel or inventive to claim 14.
- 3 D1 discloses a method comprising exchanging signalling information between a telecommunications network and an IP network via a gateway device arranged to convert the signalling data between a voice-over-IP format and a SS7 format (see column 2, lines 34-49; column 5, lines 14-19; fig.1).

Hence, the subject matter of claim 26 differs from D1 in that it mentions to what kind of user connection the signalling information is belonging to: first user circuit switched, second user packet switched.

However, this feature merely describe some straightforward possibilities, a skilled

person would know without the exercise of inventive skill, in order to apply the method for exchanging signalling information.

Hence, claim 26 does not meet the requirements of Articles 33(1) and (3) PCT.

Re Item VII

Certain defects in the international application

- 1 In order to meet the requirements of Rule 6.3(b) PCT the independent claims should have been cast in the two-part form, with those features which in combination are disclosed by document D1 should be placed in a preamble Rule 6.3(b)(i) PCT and with the remaining features being included in a characterising part, Rule 6.3(b)(ii) PCT.
- 2 In order to fulfil the requirements of Rule 5.1(a)(ii) PCT, document D1 should have been identified in the introductory part of the description and the relevant background art disclosed therein should have been briefly discussed, preferably in such a way that the inventive merit of what is claimed can be readily understood.

As for document D3 = WO 99 29124 (classified as P,X in the International Search Report), its publication date should have been identified in the description.

- 3 Reference signs placed in parentheses should have been inserted into the claims to increase their intelligibility (see Rule 6.2(b) PCT). This applies to both the preamble and the characterising portion.

Re Item VIII

Certain observations on the international application

- 1 Independent method claim 1 does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3 PCT, that any independent claim must contain all the technical features essential to the definition of the invention.

In view of the description (see page 3, lines 9-19), it seems that *transmitting signalling information from a first signalling point to a first gateway, formatting the signalling information at the first gateway into a format suitable for transmission over an IP network, transmitting the formatted information from the first gateway to a second gateway over an IP network, receiving the formatted information at the second gateway and recovering therefrom the original signalling information and transmitting the recovered signalling information to a second signalling point* indeed represent essential features to define the invention (see also claims 2-6).

An analogous objection is valid for independent apparatus claim 14 and the features from page 5, lines 6-11 (see also claim 15).

- 2 Apparatus claim 14 includes a logical error because of claiming that the apparatus comprises an IP based network. It seems not possible that an apparatus comprises an IP based network. Hence, said wording renders the claim vague (Article 6 PCT).
- 3 From the wording of claim 15 it seems that the "gateway device coupled to a signalling point and also to an IP based network" is identical to "the means for transmitting signalling information between signalling points via an IP based network" of claim 14. Having two different means which seem to have the same functionality renders the claim vague (Article 6 PCT).
- 4 From the wording of claim 7 it is not clear what is carried by a first transmission network: "the signalling information" or "a subscriber-to-subscriber voice or data traffic channel" (Article 6 PCT). Further the "is" of "is carried" is missing. A related clarity problem exists for claim 25.
- 5 The use of the undefined acronym SIP renders claim 22 vague because the meaning of the claim should be clear from the wording of the claim alone. The acronym should therefore be replaced by its extended version (Article 6 PCT). Further, the acronyms SIP, MAP and INAP are used on page 6 without presenting there extended versions.
- 6 On page 9 line 15 of the description an "n" should be added to the word "give".

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EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI99/00790

Further in line 18 the reference number of the gateway devices should be corrected to "10".

- 7 Table 1 (page 12) contains the inequality " $2 \leq n \leq 272$ ". This is logically not correct, because n could not be smaller or equal than 2 and at the same time greater or equal than 272.

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ EP

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 8J14PC
International application No. PCT/FI99/00790	International filing date (day/month/year) 24 September 1999 (24.09.99)	(Earliest) Priority date (day/month/year) 25 September 1998 (25.09.98)
Title of invention SIGNALLING IN A TELECOMMUNICATIONS SYSTEM		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) TELEFONAKTIEBOLAGET LM ERICSSON (publ) S-126 25 Stockholm Sweden		Telephone No.: Facsimile No.: Teleprinter No.:
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Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) MECKLIN, Tomas Laaksolahdentie 11 E FIN-02720 Espoo Finland		
State (that is, country) of nationality: FI	State (that is, country) of residence: FI	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) HEINONEN, Veli-Pekka Ajurinkuja 5 D 32 FIN-02600 Espoo Finland		
State (that is, country) of nationality: FI	State (that is, country) of residence: FI	
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Continuation of Box No. II APPLICANT(S)

If none of the following sub-boxes is used, this sheet should not be included in the demand.

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Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name: for a legal entity, full official designation.
The address must include postal code and name of country.)*BORENIUS & CO OY AB
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☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filedthe description ☒ as originally filed☐ as amended under Article 34the claims ☒ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☒ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (specify) | : | sheets |

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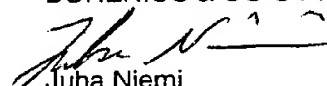
The demand is also accompanied by the item(s) marked below:

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| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
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| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (specify): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

BORENIUS & CO OY AB


Juha Niemi
patent agent

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1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.

☐ The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.

5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

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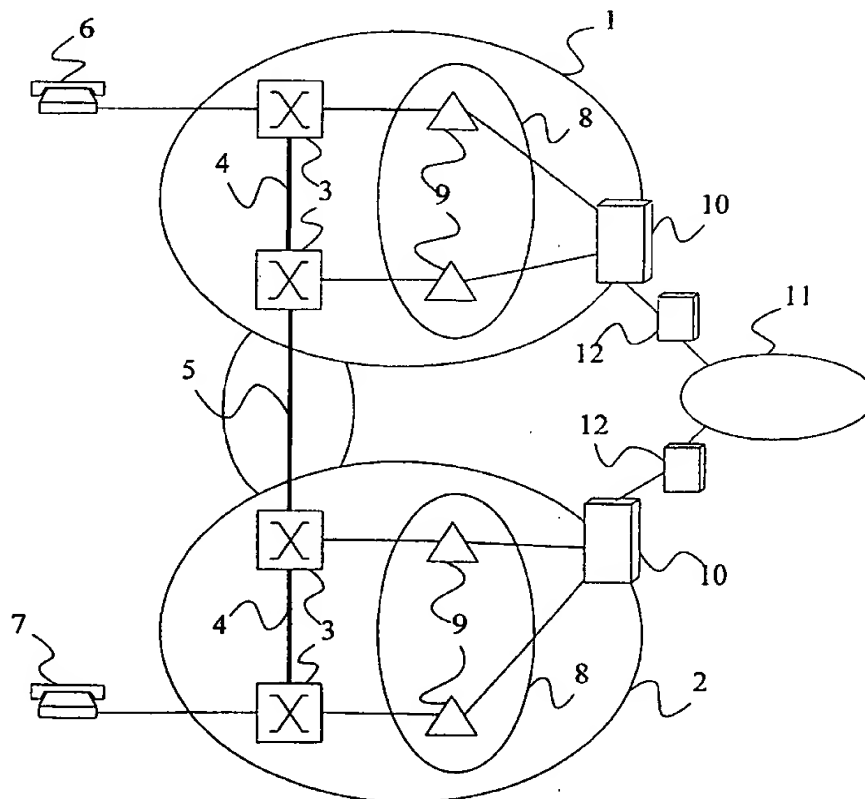
(51) International Patent Classification ⁷ : H04M 7/00		A2	(11) International Publication Number: WO 00/19694
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<p>(21) International Application Number: PCT/FI99/00790</p> <p>(22) International Filing Date: 24 September 1999 (24.09.99)</p> <p>(30) Priority Data:</p> <table> <tr> <td>982073</td> <td>25 September 1998 (25.09.98)</td> <td>FI</td> </tr> <tr> <td>982368</td> <td>30 October 1998 (30.10.98)</td> <td>FI</td> </tr> </table> <p>(71) Applicant (for all designated States except US): TELEFON-AKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): MECKLIN, Tomas [FI/FI]; Laaksoahdentie 11 E, FIN-02720 Espoo (FI). HEINONEN, Veli-Pekka [FI/FI]; Ajurinkuja 5 D 32, FIN-02600 Espoo (FI). FÖRSTRÖM, Roger, Raimond [FI/FI]; Skolängsvägen 8, FIN-10410 Åminnefors (FI). BJÖRKLUND, Leif, Erik [FI/FI]; Avaruuskatu 3 H 150, FIN-02210 Espoo (FI).</p> <p>(74) Agent: BORENIUS & CO OY AB; Kansakoulukuja 3, FIN-00100 Helsinki (FI).</p>	982073	25 September 1998 (25.09.98)	FI	982368	30 October 1998 (30.10.98)	FI	<p>(81) Designated States: AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), DM, EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published Without international search report and to be republished upon receipt of that report.</p>
982073	25 September 1998 (25.09.98)	FI					
982368	30 October 1998 (30.10.98)	FI					

(54) Title: SIGNALLING IN A TELECOMMUNICATIONS SYSTEM

(57) Abstract

A method of transmitting signalling information between signalling points (3, 9) of a telecommunications system, the signalling information being associated with a subscriber-to-subscriber (6, 7) voice or data traffic channel carried by a circuit switched channel transmission network (1, 2). The method comprises transmitting signalling information between said signalling points (3, 9) via a TCP/IP network (11) which is separate from the circuit switched channel transmission network.



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Signalling in a Telecommunications System

Field of the Invention

- 5 The present invention relates to signalling in a telecommunications system and in particular, though not necessarily, to the transmission of signalling data associated with voice or data calls.

Background to the Invention

10

In a telecommunications system, signalling equipment and signalling channels are required for the exchange of information between system elements or nodes. In particular, this internode signalling informs the nodes of what is to be performed when a telephone or data call is to be set up or released in so-called "circuit-switched" connections. Modern telecommunications systems now largely make use of Common Channel Signalling (CCS) whereby signalling information is transmitted on one or more dedicated signalling channels, distinct from the channels used to carry actual user information (e.g. voice or data). An important feature of CCS is that the same signalling system may support services in a variety of existing telecommunications protocols, e.g. Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN), and Public Land Mobile Networks (PLMN), as well as proposed future protocols such as B-ISDN, enhancing greatly the interoperability of networks supporting different protocols.

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Currently, the predominant CCS is known as Signalling System Number 7 (SS7), defined in the ITU-T (International Telecommunications Union - Technical) recommendations starting with Q.700. SS7 is a packet switched system occupying one time slot per frame of the Time Division Multiple Access (TDMA) E.1 or T.1 transmission formats (the other time slots being available for user data). Individual signalling message packets (datagrams) are associated with respective individual telephone calls. As only a relatively small amount of signalling information is

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associated with a single telephone call, a single SS7 channel is able to handle all signalling between two network nodes (termed "signalling points") for several thousands of calls. It is noted that the route taken by a signalling message in the SS7 network may be the same as that over which the associated telephone call is
5 established, or it may be different.

As already noted, SS7 (along with other CCS systems) is able to support a number of different telecommunications protocols (e.g. PSTN, ISDN, PLMN). In signal processing terms, SS7 comprises a Message Transfer Part (MTP) which deals with
10 the physical transfer of signalling information over the signalling network, i.e. message formatting, error detection and correction, etc, and user parts and application parts which allow several "users" (i.e. ISDN User Part, Telephony User Part, etc) to send signals in the same signalling network.

15 SS7 makes use of addresses known as Point Codes to route signalling data through the "visibility area" of a telecommunications network, the visibility area typically being the network itself together with the interfaces between the network and "foreign" networks under the control of other operators. A Point Code is placed in the header of a signalling packet and is examined by a network signalling point (SP)
20 upon receipt of the packet to determine the next hop for the packet *en route* to its destination.

In an SS7 network, any change in the Point Code allocation within the visibility area requires the operator to update the Point Code database (or routing table)
25 which exists in each SP of the network. This however adds significantly to the maintenance overheads of the network. The dedicated nature of SS7 makes it in general expensive to install and maintain (in relation to both hardware and software), a significant barrier especially to prospective new telecom operators. Furthermore, as an SS7 network occupies bandwidth on TDMA frames of the
30 E.1/T.1 transmission protocols (one slot per time frame), the bandwidth available for actual user call data is restricted. Yet another disadvantage of traditional

signalling architectures is that the interoperability of SS7 networks is limited due to the dedicated nature of the MTP physical layers.

Summary of the Present Invention

5

It is an object of the present invention to overcome or at least mitigate the above noted disadvantages of existing telecommunication signalling systems.

According to a first aspect of the present invention there is provided a method of
10 transmitting signalling information between signalling points of a telecommunications system, the method comprising transmitting signalling information between said signalling points via a IP based network. The method preferably including the steps of transmitting signalling information from a first signalling point to a first gateway, formatting the signalling information at the first
15 gateway into a format suitable for transmission over an IP network, transmitting the formatted information from the first gateway to a second gateway over an IP network, receiving the formatted information at the second gateway and recovering therefrom the original signalling information, and transmitting the recovered signalling information to a second signalling point.

20

Embodiments of the present invention enable the separation of information for transmission through the system into call information and signalling information. The use of the IP based network for transmitting signalling information releases capacity in the originating system for use by call information. In addition, the use
25 of the IP network reduces the need for conventional signalling infrastructure (although this may still be used in part). IP based networks offer increased flexibility (e.g. routers of the network have self-updating routing tables) and reduced operating, maintaining, and engineering costs in comparison with conventional telecommunications signalling networks.

30

Preferably, the signalling information being associated with a subscriber-to-subscriber voice or data traffic channel carried by a first transmission network.

Preferably, said first transmission network is a circuit switched network, using for
5 example PSTN, ISDN, or PLMN protocols, or a combination of these protocols.

Preferably, said signalling points between which the user call information and the signalling information is transmitted are switching points (e.g. exchanges) of the telecommunication system, or signalling transfer points. The IP based network may
10 also be used *inter alia* to transmit signalling information to and from Intelligent Network nodes.

Signalling information may be transmitted between said signalling points in part via a packet switched signalling network different from said IP based network,
15 signalling information being converted from one format to another at the network interfaces. For example, said packet switched signalling network may be a common channel signalling network such as a Signalling System No.7 (SS7) based network.

In a preferred embodiment of the present invention, signalling information is
20 transmitted between a group of locally arranged signalling points using an SS7 network. Signalling information intended for signalling points outside the local area is transmitted to a gateway node which provides an interface between the SS7 network and the IP network. In the same way, the gateway node provides an interface for signalling information transmitted through the IP network to a local
25 signalling point.

Preferably, the signalling data transmitted through the IP network comprises signalling information associated with call set-up and call termination in the first transmission network of the telecommunications system. Signalling information
30 relating to call charging may also be transmitted through the IP network.

According to a second aspect of the present invention there is provided an apparatus for transmitting signalling information between signalling points of a telecommunications system, the apparatus include an Internet Protocol (IP) based network forming at least part of a transmission link between said signalling points, and means for transmitting signalling information between said signalling points via the IP based network. The apparatus preferably further include a gateway device coupled to a signalling point and also to an Internet Protocol (IP) based network, wherein the gateway device is arranged to receive signalling information from said signalling point coupled thereto and to convert that information into a format suitable for transmission over the IP network and to perform a reverse conversion for signalling information from the IP network.

Preferably, the gateway device is a Signalling System No.7 (SS7)/Internet Protocol (IP) gateway device.

In certain embodiments of the present invention, the gateway devices of the apparatus are standalone devices. In other embodiments, however, the gateway devices may be integrated into a signalling point or a signalling transfer point.

The gateway nodes may be coupled to the IP network via respective Internet Access Servers. Alternatively, the gateway nodes may be coupled directly to the IP network.

Preferably, the gateway nodes are coupled to respective signalling points/signalling transfer points via PCM or TDMA links, e.g. E.1 (2Mb/s, 32 channels) or T.1 (1.5Mb/s, 24 channels).

Preferably, the gateway nodes are coupled to respective IASs via packet switched data links, e.g. using ethernet or ATM.

The gateway devices may be provided with conversion means for converting between the ISUP messaging format and the SIP messaging format; between an H.323 messaging format and the SS7 call set-up format, between ISUP and a network access server control protocol, e.g. etheric; or between ISUP and a voice-over-IP control protocol, e.g. Q.767++.

The gateway devices may be provided with an interface for tunnelling SS7 application part messages over IP. For example, the gateway devices may each have one of the following protocol stacks arranged on the SS7 and IP sides:

SS7 side	IP side
ISUP/MTP	ISUP/IP
MAP/TCAP/MTP	MAP/TCAP/IP
INAP/TCAP/MTP	INAP/TCAP/IP

10

The gateway nodes may be arranged to determine the IP routing address for a received message or series of messages from one or more of the Signalling Link Selection + Service Information Octet, Subsystem number, and Global Title Translation.

15

Preferably, the signalling information is associated with a subscriber-to-subscriber voice or data traffic channel carried by a first transmission network.

20

According to a third aspect of the present invention there is provided a method of communicating voice and other user information between a pair of end users, a first of the end users having a circuit switched connection to a telecommunications network and the second of the end users having a packet switched connection to an IP network, the method comprising exchanging signalling information between the telecommunications network and the IP network via a gateway device arranged to convert the signalling data between a voice-over-IP format and an SS7 format.

25

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

5 Figure 1 illustrates schematically a telecommunications system comprising two interconnected telecommunications networks;

 Figure 2 illustrates functionally the architecture of a gateway device of the system of Figure 1;

 Figure 3 illustrates schematically the signal processing layers of the SS7
10 protocol;

 Figure 4 illustrates the processing layers present at a gateway node of the system of Figure 1;

 Figure 5 illustrates the flow of signalling data associated with call set up and termination in the system of Figure 1; and

15 Figure 6 is a flow diagram illustrating the signalling process employed in the system of Figure 1.

Detailed Description of Certain Embodiments

20 A telecommunications system in which the present invention may be employed typically comprises one or more interconnected telecommunications networks. These networks may make use of the same telecommunications protocols (e.g. ISDN, PSTN, PLMN) or may use different protocols. In addition, the networks may be operated by the same or by different operators. However, the networks
25 have in common that they use Signalling System No.7 for communicating signalling information between internally located signalling points (SP).

 Considering Figure 1, this illustrates a much simplified telecommunications system comprising only two telecommunications networks 1,2. Both of these networks 1,2
30 are assumed to be Integrated Digital Services Networks (ISDN). Each network comprises a number of switching exchanges 3 interconnected by trunk lines 4. In

addition, a trunk line 5 provides a link between exchanges 3 of the two networks 1,2.

In order to connect a call, placed from a first subscriber telephone 6 (A-subscriber) to a second subscriber telephone 7 (B-subscriber) connected to local exchanges of the respective networks, it is necessary for the system to reserve a traffic channel between each of the four illustrated exchanges 3, using the trunk lines 4,5. Each traffic channel is a circuit switched channel, i.e. comprising a reserved time slot in each consecutive transmission frame, and as such the network through which a call is routed is referred to here as a "circuit-switched network".

As already mentioned above, conventionally, the interexchange signalling required to set up the various circuit switched channels is conveyed by SS7. In the system of Figure 1, an SS7 network 8 is provided in each of the telecommunications networks 1,2. Each SS7 network 8 handles the flow of signalling information between signalling points (e.g. exchanges 3) of the associated network. Signalling information may be routed directly between two signalling end points, or it may be routed through intermediate Signalling Transfer Points (STP) 9. It will be appreciated that although the SS7 networks are illustrated in Figure 1 as being distinct from the circuit switched network, the SS7 networks may make use of the trunk lines 4 for transmitting signalling data, and that the STPs 9 may be associated with respective exchanges 3.

Each of the networks 1,2 comprises a gateway device 10 which provides an interface for the SS7 network 8 to an IP network 11. In Figure 1, the gateway devices 10 are coupled to the IP network 11 via respective Internet Access Servers 12, although it will be appreciated that this coupling may be achieved directly without intervening Internet Access Servers 12.

It is noted here that the term "IP network" is intended to include networks utilising the current *de facto* IP standard as defined by the Internet Engineering Taskforce or

a future derivative thereof (including the TCP or UDP protocol layers). The network 11 may be a closed network under the control of the telecommunications network operator(s), i.e. an intranet, or an open network accessible through the World Wide Web (i.e. the Internet). In either case, the substitution of the IP network for a significant part of the SS7 network provides a number of significant advantages, chiefly a reduction in the signalling traffic and processing required in the conventional telecommunications network and replacement of expensive, dedicated telecommunications infrastructure with low cost, flexible datacom infrastructure.

10

For each of the networks 1,2, the gateway device 10 is coupled on the one side to the Internet Access Server 12, and on the other side to STPs 9 of the SS7 network 8. Whilst the gateway device 10 may be connected to every STP 9 of the SS7 network 8, it is preferred that connection is made to only a subset of all STPs 9 of the SS7 network 8, such that signalling information to be transmitted between a give STP 9 and the gateway device 10 may require routing through one or more intermediate STPs 9. Figure 2 illustrates schematically a possible architecture for the gateway devices 12.

15

It will be appreciated that signalling information to be transmitted from a signalling point of one network 1,2, to a signalling point of the other network, through the TCP/IP network 11, requires protocol conversion at both of the gateway devices 10. More particularly, it is necessary to process signalling messages such that the physical message construction, and associated error detection and correction processes etc., are appropriate for the medium over which the message is next to be transmitted.

20

Figure 3 illustrates the seven layers (or levels) which compose the SS7 protocol. These layers will not be described here in detail, but rather the reader should make reference to the ITU-T recommendations starting with Q.700. It is sufficient here to note that layers 1 to 3 provide the physical, datalink, and network layers, whilst

25

30

layers 4 to 7 provide user parts and application parts which are generally network specific (in particular, the TCAP provides transaction capabilities for services such as INAP, MAP, OMAP, etc.).

5 Figure 4 illustrates the processing layers which are provided at the gateway device 10 in order to provide for the conversion of signalling messages between the SS7 protocol and the TCP/IP protocol. On the SS7 network side of the interface, there is provided the MTP of the SS7 protocol, whilst on the TCP/IP side the MTP is replaced by TCP/IP protocol layers. Signalling messages received at the gateway
10 device 10 from the SS7 network 8 are thus processed through the MTP to retrieve the signalling information originally generated within an SP of the SS7 network by a user part.

At the gateway device 10, this user part generated data is passed by the MTP to an
15 intermediate processing layer (identified by reference numeral 13). This layer 13 adds to each signalling message a header (9bits) indicating the number of octets which the message contains. The processed messages are then passed to the TCP/IP protocol layers where they are organised for transmission over the TCP/IP network 11 via the IAS 12. A single TCP/IP datagram may contain several signalling
20 messages, such that the datagram has the structure illustrated in Table 1 below, and where SIF is the Signalling Information Field and SIO is the Signalling Information Octet.

In the same way, when signalling data is received at a gateway device 10 from the
25 IAS 12, the signalling information is processed through the TCP/IP layers to recover the user part generated data, with the signalling message length header being removed in the intermediate layer 13, before passing the data to the MTP in preparation for transmission over the SS7 network 8.

30 It is noted that Figure 4 illustrates a user part(s) layer above the MTP and TCP/IP layers. However, this layer is not normally utilised in the gateway device unless the

device is directly connected to a switching exchange 3 such that signalling information can be passed directly from the user parts (e.g. TUP, ISUP, etc.) to the TCP/IP layers and *vice versa*.

- 5 It will also be appreciated that whilst signalling messages are routed in the SS7 network using SS7 Point Codes, messages in the IP network are routed using IP addresses. Gateway devices may therefore be provided with a database mapping point codes to IP addresses, using dynamic updating if necessary.
- 10 Figure 5 illustrates the flow of signalling information associated with set up and termination of a call between the two telephones 6,7 of Figure 1, where the signalling points are identified using the same symbols as are used in Figure 1. Figure 6 is a flow diagram illustrating the signalling process described above.
- 15 It will be appreciated by the person of skill in the art that modifications may be made to the above described embodiments without departing from the scope of the present invention. For example, whilst the user voice or data channel has been described above as being a circuit switched channel (E.1/T.1), this channel may be provided, in whole or in part, by a packet switched channel, e.g. where the call is
- 20 made from or to a mobile telephone registered with a mobile network utilising the proposed General Packet Radio Service (GSM phase 2+).

IP header			
TCP header			
Octets, 9bits	Spare, 7bits	SIO, 8bits	SIF
8n (2=>n=>272			
:			
:			
:			
Octets, 9bits	Spare, 7bits	SIO, 8bits	SIF
8n (2=>n=>272			
SIF cont.			

5

Table 1

Claims

1. A method of transmitting signalling information between signalling points of a telecommunications system, the method comprising transmitting signalling
5 information between said signalling points via Internet Protocol (IP) based network.
2. A method according to claim 1, further comprising transmitting signalling information from a first signalling point to a first gateway.
- 10 3. A method according to any of the preceding claims, further comprising formatting the signalling information at the first gateway into a format suitable for transmission over an IP network.
4. A method according to any of the preceding claims, further comprising
15 transmitting the formatted information from the first gateway to a second gateway over an IP network.
5. A method according to any of the preceding claims, further comprising receiving the formatted information at the second gateway and recovering therefrom
20 the original signalling information.
6. A method according to any of the preceding claims, further comprising transmitting the recovered signalling information to a second signalling point.
- 25 7. A method according to any of the preceding claims, wherein the signalling information being associated with a subscriber-to-subscriber voice or data traffic channel carried by a first transmission network.
8. A method according to claim 7, wherein said first transmission network is a
30 circuit switched network.

9. A method according to any of the preceding claims, wherein said signalling points between which the user call information and the signalling information is transmitted are switching points of the telecommunication system.

5

10. A method according to any of the preceding claims and comprising transmitting signalling information between said signalling points in part via a packet switched signalling network different from said IP based network, signalling information being converted from one format to another at the signalling network
10 interfaces.

11. A method according to claim 10, wherein said packet switched signalling network is Signalling System No. 7 (SS7) based network.

15 12. A method according to claim 11 and comprising transmitting signalling information between a group of locally arranged signalling points using an SS7 network, whilst transmitting signalling information intended for signalling points outside the local area to a gateway device which provides an interface between the SS7 network and the IP network.

20

13. A method according to any of the preceding claims, wherein the signalling information transmitted through the IP network comprises signalling information associated with call set-up and call termination in the first transmission network of the telecommunications system.

25

14. An apparatus for transmitting signalling information between signalling points of a telecommunications system, the apparatus comprising:

an Internet Protocol (IP) based network forming at least part of a transmission link between said signalling points; and

means for transmitting signalling information between said signalling points via the IP based network.

15. An apparatus according to claim 14, further comprising a gateway device
5 coupled to a signalling point and also to an Internet Protocol (IP) based network,
wherein the gateway device is arranged to receive signalling information
from said signalling point coupled thereto and to convert that information into a
format suitable for transmission over the IP network and to perform a reverse
conversion for signalling information from the IP network.
- 10 16. An apparatus according to claim 15, wherein the gateway device is a
Signalling System No.7 (SS7)/Internet Protocol (IP) gateway device.
17. An apparatus according to claims 15 or 16, wherein the gateway device is a
15 standalone device.
18. An apparatus according to any one of claims 15-17, wherein the gateway
device is integrated into respective signalling point.
- 20 19. An apparatus according to any one of claims 15-18, wherein the gateway
device is coupled to the IP network via respective Internet Access Server (IAS).
20. An apparatus according to claim 19, wherein the gateway device is coupled
to respective IAS via packet switched data links.
- 25 21. An apparatus according to any one of claims 15-20, wherein the gateway
device is coupled to respective signalling point via PCM or TDMA links.
22. An apparatus according to any one of claims 15-21, wherein the gateway
30 device is provided with conversion means for converting between: the ISUP

messaging format and the SIP messaging format; an H.323 messaging format and the SS7 call set-up format; ISUP and a network access server control protocol; or between ISUP and a voice-over-IP control protocol.

5 23. An apparatus according to any one of the claims 15-22, wherein the gateway device may be provided with an interface for tunnelling SS7 application part messages over IP.

24. An apparatus according to any one of the claims 15-23, wherein the gateway
10 device is arranged to determine the IP routing address for a received message or series of messages from one or more of: the Signalling Link Selection + Service Information Octet; Subsystem number; and Global Title Translation.

25. An apparatus according to any one of the claims 14-24, wherein signalling
15 information is associated with a subscriber-to-subscriber voice or data traffic channel carried by a first transmission network.

26. A method of communicating voice and other user information between a pair of end users, a first of the end users having a circuit switched connection to a
20 telecommunications network and the second of the end users having a packet switched connection to an IP network, the method comprising exchanging signalling information between the telecommunications network and the IP network via a gateway device arranged to convert the signalling data between a voice-over-IP format and a SS7 format.

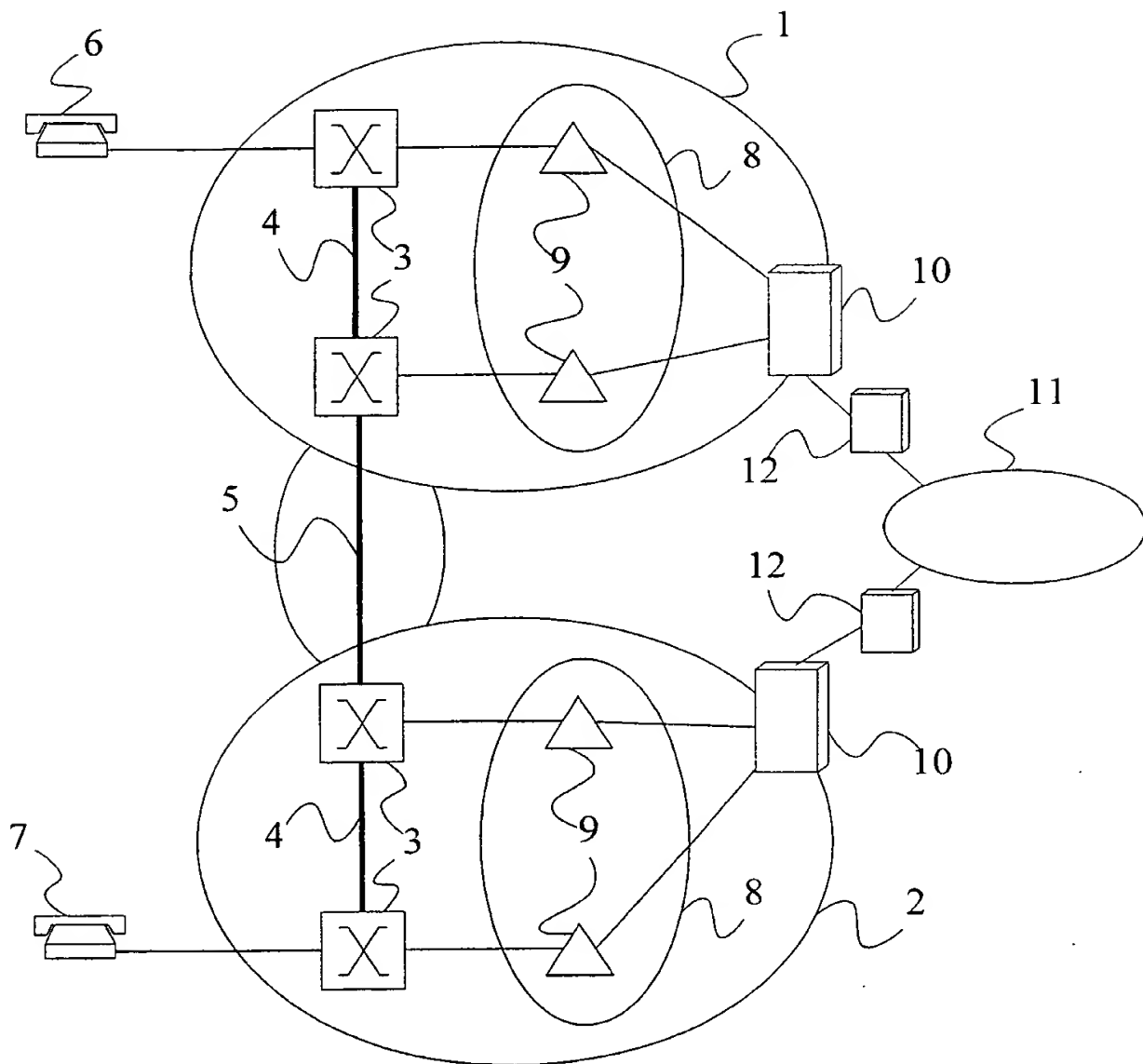
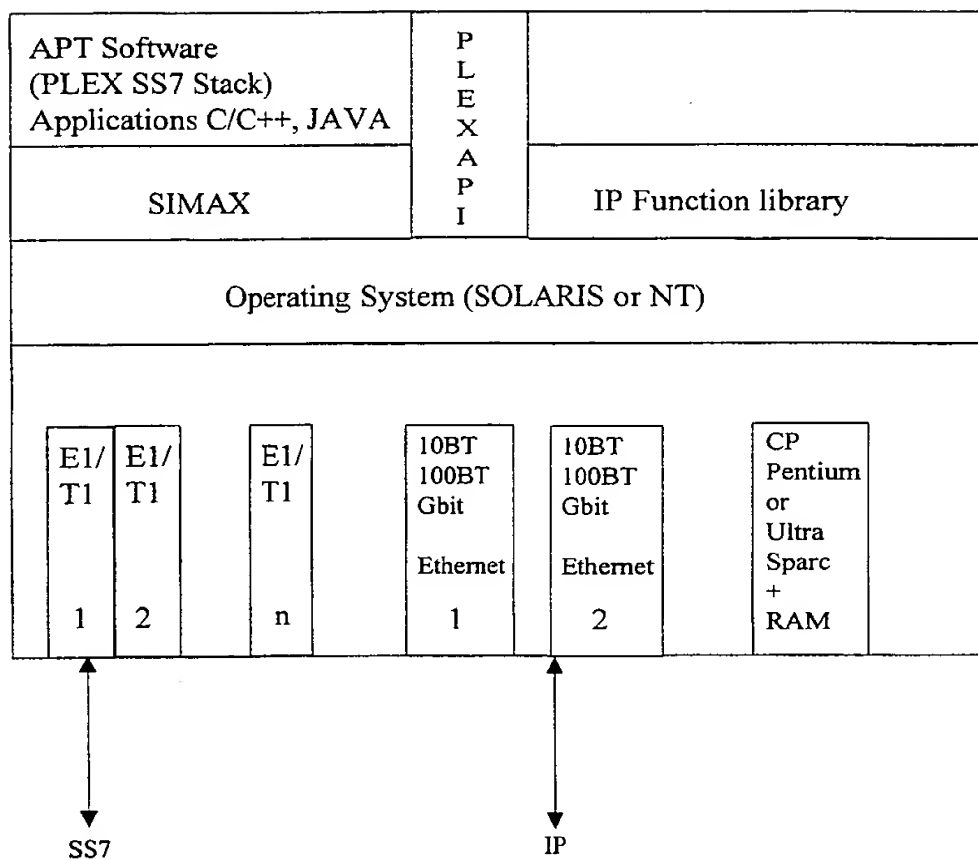
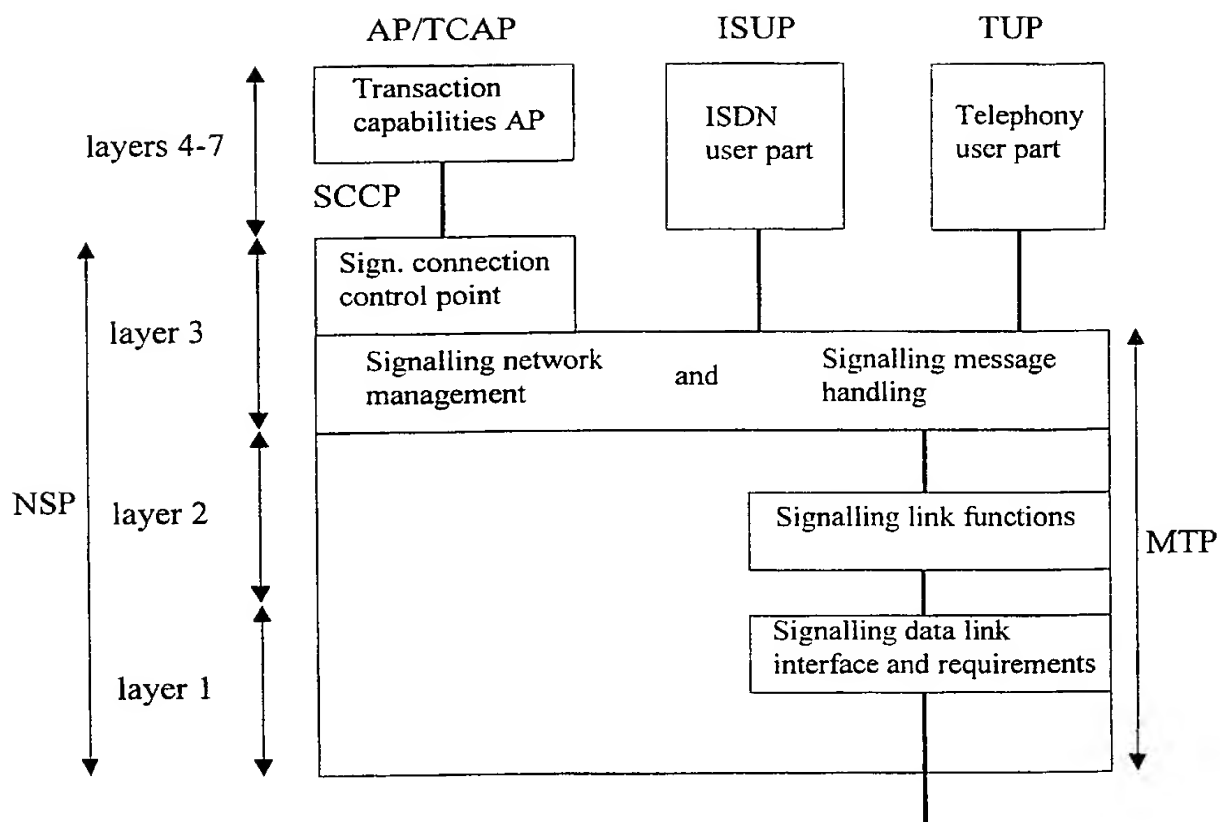
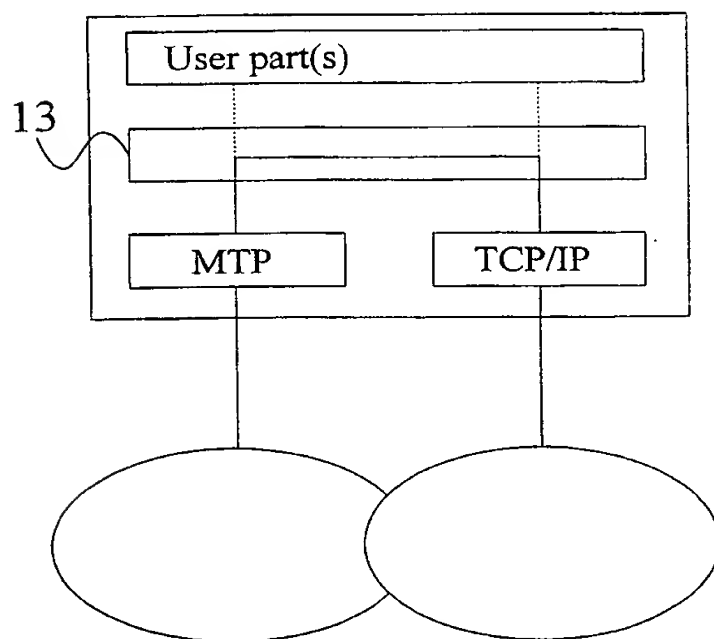
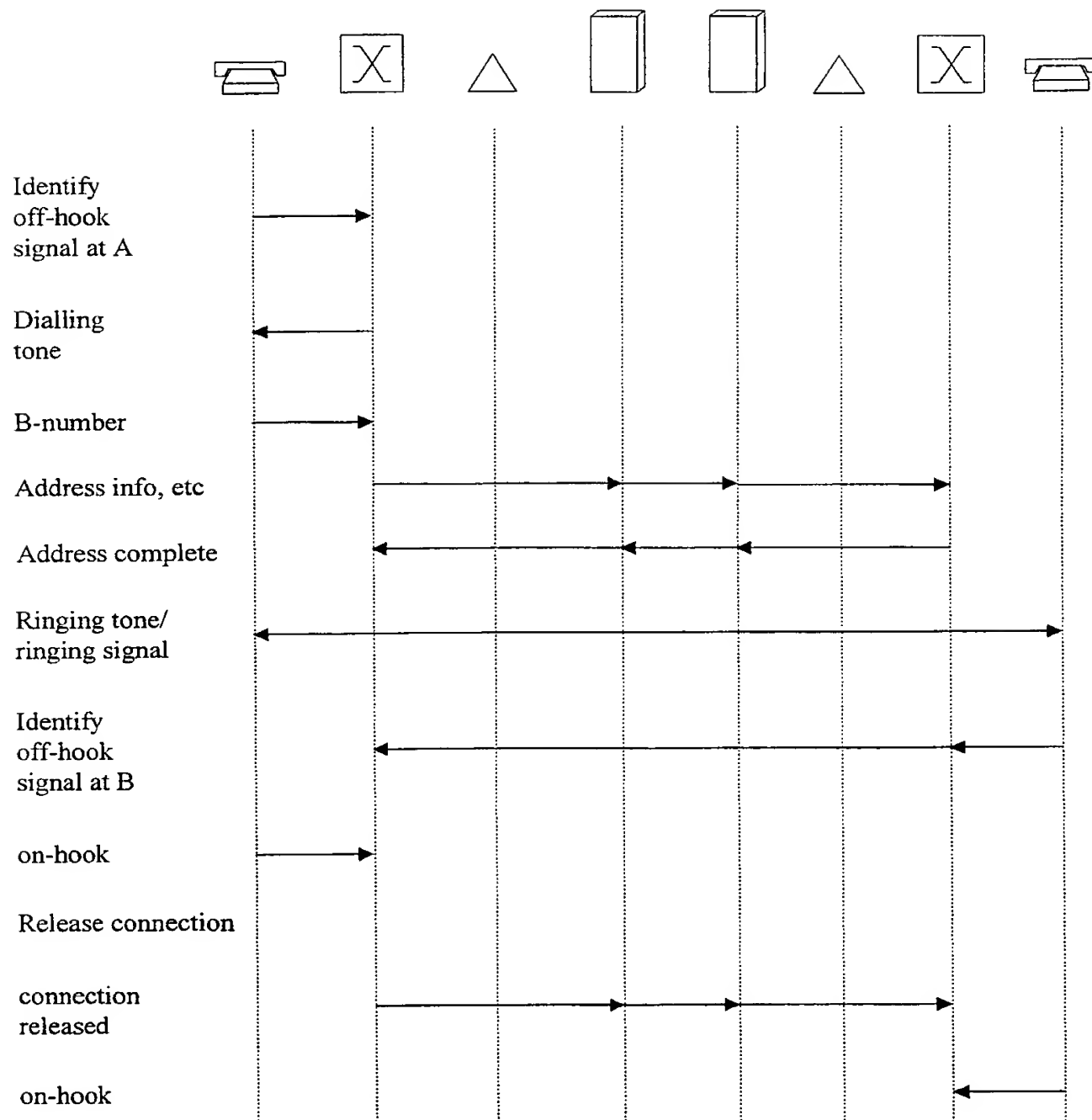


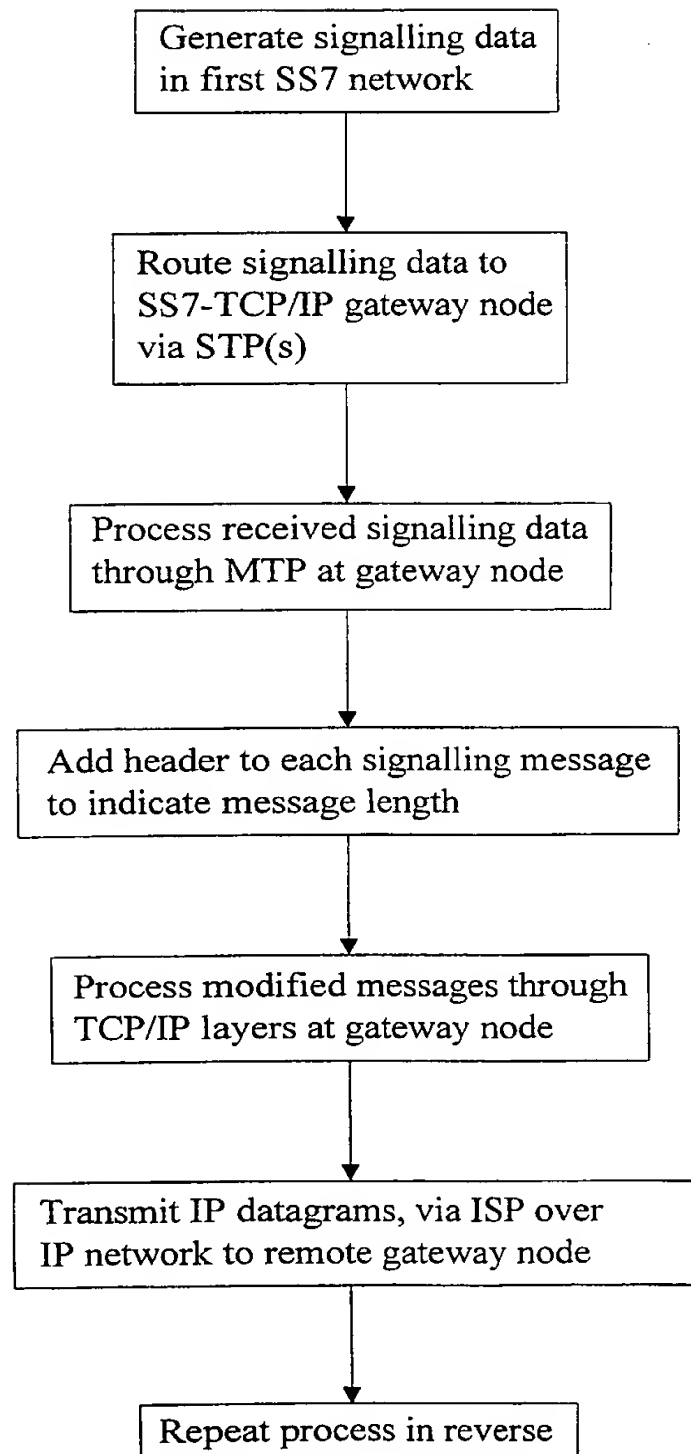
Figure 1

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Figure 2

Figure 3Figure 4

Figure 5

Figure 6

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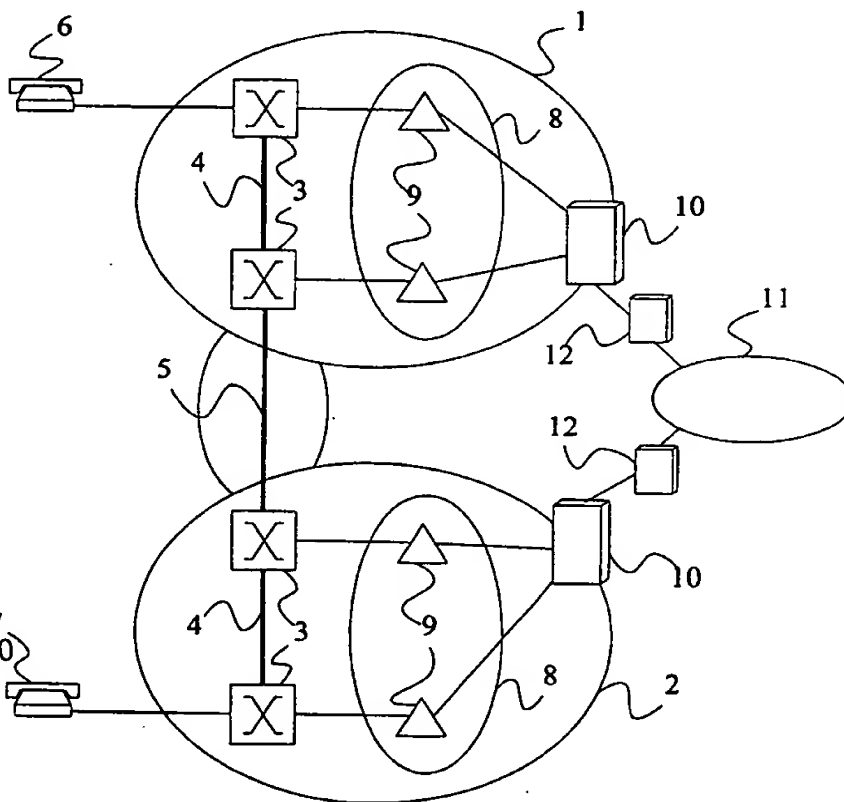
(88) Date of publication of the international search report:

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(57) Abstract

A method of transmitting signalling information between signalling points (3, 9) of a telecommunications system, the signalling information being associated with a subscriber-to-subscriber (6, 7) voice or data traffic channel carried by a circuit switched channel transmission network (1, 2). The method comprises transmitting signalling information between said signalling points (3, 9) via a TCP/IP network (11) which is separate from the circuit switched channel transmission network.



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00790

A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	WO 9742774 A2 (TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)), 13 November 1997 (13.11.97), page 2, line 28 - page 3, line 18; page 4, line 8 - line 22 --	1-26
A	WO 9729581 A1 (I-LINK WORLDWIDE, INC.), 14 August 1997 (14.08.97), abstract --	1-26

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00790

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

02/12/99

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